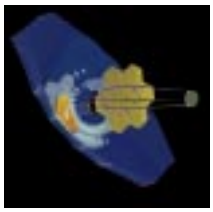
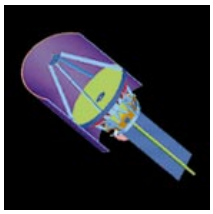
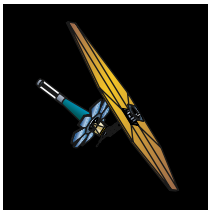






Engineers are studying several possible designs for the Next Generation Space Telescope. Compared with Hubble's bus-sized dimensions, the spacecraft would be significantly smaller to fit inside an unmanned launch vehicle.

NGST

Next Generation Space Telescope

Observing the Dawn of Time

Understanding our Evolution

Searching for the origin of the universe is very much like archeology. Astronomers, like archeologists, must peel away the strata of time to find clues.

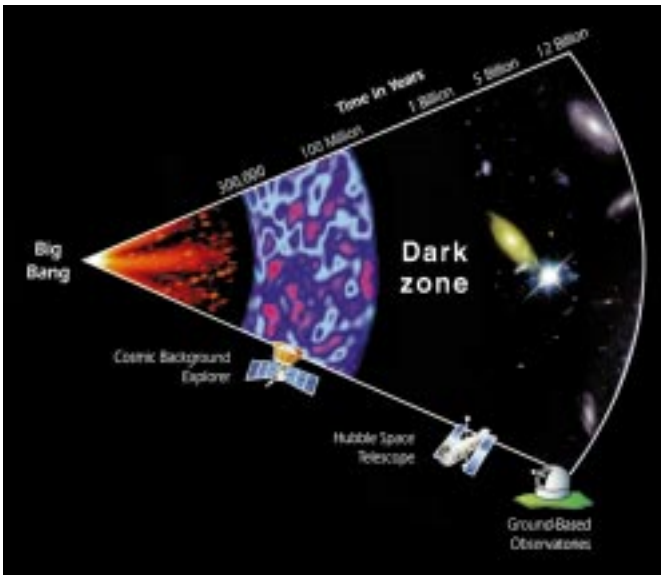
Nowhere is this better demonstrated than with the Hubble Space Telescope. This remarkably successful observatory achieved what no other telescope has accomplished so far: It peered back to the edge of the visible universe to uncover a tantalizing view of early galaxies that formed perhaps 5 billion years after the Big Bang. NASA's Cosmic Background Explorer (COBE) also contributed to our understanding of the early universe by detecting the seeds of galaxies and other large-scale structures that began to evolve just 300,000 years after the Big Bang.

But the mystery remains.

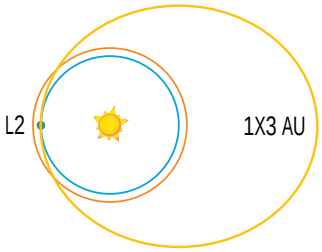
How did the seeds detected by COBE condense into the stars and galaxies observed by Hubble? How did the universe evolve from a hot, dense plasma produced by the Big Bang to the much cooler world of stars and galaxies?

Unlocking the Mystery

Only with a Next Generation Space Telescope will we be able to observe the period when the primordial seeds began to evolve into the galaxies and stars we see today. Only with a Next Generation Space Telescope will we find the clues that remain hidden by time and discover how our universe evolved.



This graphic shows our current understanding of how the universe evolved from the Big Bang to the plethora of galaxies and stars seen today. The Next Generation Space Telescope will probe the era when stars and galaxies started to form, the "Dark zone" beyond the reach of current telescopes. Its advanced capabilities also make it ideal for quantitative studies of galaxies, stars, and more nearby star-forming regions.



To enhance its performance, scientists hope to place the observatory as far from the Earth-Moon system as possible to reduce stray light and to maintain the observatory's cool temperature.

The Mission and Vision

To observe the earliest galaxies, astronomers need a much larger and cooler observatory equipped with cameras and spectrographs sensitive to near infrared wavelengths and chilled to the low temperatures of outer space. The Next Generation Space Telescope is such an observatory.

Outfitted with a 6- to 8-meter mirror telescope, passively cooled to 70 degrees Kelvin or lower, and located beyond the moon's orbit, the observatory will be up to 1,000 times more sensitive than any existing or planned ground- or space-based observatory. Its proposed orbit, suite of instruments and mirror size make it ideal for studying the evolution of the universe as well as objects relatively close to home.

With such a capability — fully supported by the astronomy community — we will finally lift the veil that now obscures the universe's first billion years.

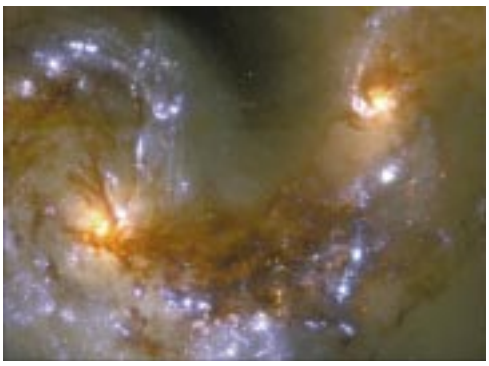
NGST Goals

	Performance Requirements	Desired Capabilities
Aperture collecting area (m^2)	*>12*	*>50*
Wavelength (μm)	*1–5*	*0.5–30*
Imaging resolution (@1–2 μm)	*0.050"*	*0.050"*
Lifetime (years)	*>5*	*10*
Instrument capabilities	*Wide FOV camera/spectrograph Zodi-limited background*	*Thermal IR camera/spectrograph coronagraph*

The Challenge

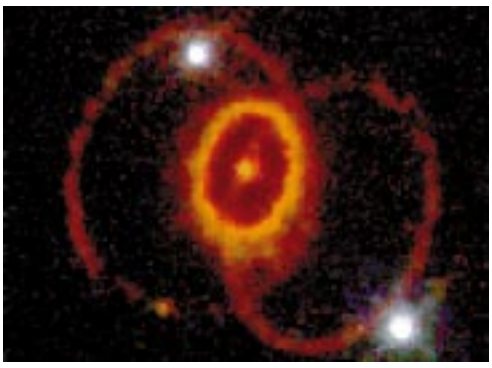
Without question, the Next Generation Space Telescope must overcome several technical challenges. It requires a very different design from any flown before and new technology to make it affordable. The main conceptual breakthroughs needed to carry out such a mission, however, are available. Furthermore, the space industry has evolved to the point where it now offers standard, off-the-shelf commercial products for spacecraft design.

What we might learn by flying a Next Generation Space Telescope capable of observing the early universe is incalculable. History has shown that many of the world's most profound discoveries happen by accident. Because we cannot definitely predict the outcome, we can only prepare for the possibilities. That is the objective — preparing for the next generation of discovery and discovering our origins.



Galaxy Mergers

One of the questions the Next Generation Space Telescope is expected to answer is what role galaxy mergers played in the evolution of the universe. Astronomers once thought that galaxies were static; however, observations, such as this one by the Hubble Space Telescope, prove that they collide, merge, cannibalize each other and change shape.



Supernova 1987A

When stars explode, they eject material back into space and the process of star birth begins anew. The question astronomers hope to answer is when and where the first elements formed and how star explosions, such as this one observed by the Hubble Space Telescope, affect the chemical makeup of early galaxies.

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